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(54) SUCTION HEAD FOR GRIPPER

- (71) We, CLAUDIUS PETERS AKTIENGESELLSCHAFT, a body corporate organised under the Laws of Germany, of 1 Kapstadtring, 2 Hamburg 39, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 10 The invention relates to a suction head for a vacuum operated gripper for handling filled bags.
- Devices for gripping, conveying and depositing loads which perform their functions by mechanical means or by the suction effect of a vacuum have been suggested. German Patent Specifications Nos. 2,007,533 and 2,040,931, published prior to acceptance, describe arrangements designed to lift full bags using vacuum-operated bell-shaped suction head. The rim of the suction head which grips the bag curves inwards towards the inside of the bell and/or has an undular cross-section. This is intended to ensure a tight fit between the suction head whereby pleats in an incompletely filled bag may be compensated for and a satisfactory vacuum may be maintained.
- 20 However, these bell-shaped suction heads have the disadvantage that owing to the size of the space enclosed by the rim of the bell, the volume that must be evacuated is wastefully large and high capacity vacuum equipment is needed. Moreover, the construction of the rim, as described in the two above-mentioned Specifications, creates the risk that the relatively narrow rim which makes contact with the bag will damage the bag during transportation by this type of suction head.
- According to the invention there is provided a suction head for a vacuum-operated gripper comprising: an annular suction chamber having a suction opening on an underside thereof bounded by rigid inner and outer annular rounded rims for contacting a filled bag, the underside of the inner rim defining a plane substantially at the level of, or proud or recessed with respect to, the outer rim, and the outer rim having an inside wall sloping toward the centre of the suction chamber.
- In the embodiment hereinafter described the annular shape of the suction chamber reduces the previous undesirably wasteful vacuum space to a minimum, and the associated vacuum pump may therefore be of relatively small capacity. The rounded rims, preferably of circular cross-section, of the suction head will not damage the bags. The angle of inclination of the inside face of the outer rim towards the centre of the suction head ensures that the zone of contact between the lip and the bag is broad, creating a tight joint and affording adequate support for the bag during transportation by the gripper. The rigid rims readily force the yielding and the varying shape of each bag to conform to the shape of the rims to provide a zone of contact without gaps or leaks.
- The annular vacuum chamber bounded by the outside and inside rim may contain a perforated sheet or wire mesh. This insertion forms a contact surface which prevents the material of the bag from being drawn too far into the interior of the suction head, as might otherwise be the case if the bags are loosely filled.
- In a preferred embodiment of the invention the surface surrounded by the inner rim may be offset downwards beyond the level of the plane tangent to the underside of the outer circularly rounded lip. When bags are not completely full the projecting part of the suction head will displace the contents of the bags outwards, thereby creating a better contact surface for the inclined inside face of the outer rim

of the suction head. The bag is pulled taut and the resultant tension assists in smoothing its surface and in preventing the formation of wrinkles and pleats.

- 5 On the other hand, the surface surrounded by the inner rim may also be upwardly offset from the plane defined by the outer rim.

A specific embodiment of the invention will now be described, by way of example with reference to the accompanying drawings, wherein:

Fig. 1 is a vertical section of a suction head,

- 15 Fig. 2 is a view of the suction head of Fig. 1 from above,

Fig. 3 is a section of a detail of the suction head of Fig. 1 incorporating a perforated plate in its suction chamber, and

- 20 Fig. 4 is a section of detail "Y" of the suction head of Fig. 1 in which its base plate is downwardly offset.

The suction head shown in Figs. 1 and 2 comprises a plate 1, preferably of elongated shape with rounded ends adapted to the shape of the type of bag that is to be handled, and a centrally located connection 2 for attachment thereto of a suction pipe leading to a vacuum pump. The top of the plate 1 further carries structural elements not shown in the drawing, whereby the entire suction head can be suspended from handling means of conventional kinds for lifting and lowering the suction head. Attached by bolts 4 to the underside of the plate 1 is a ring 3 which externally conforms to the periphery of the plate. The outer rim of the suction opening of the suction head is formed by an outer pipe ring 5 of circular cross-section. A radius of curvature between 10 and 15 mm. has been found to be particularly satisfactory for the pipe. The overall size of the pipe ring 5 should preferably be between $1/2$ and $2/3$ of the overall size of the bag which is meant to be gripped.

The inside wall of the outer rim, formed by the pipe ring 5, has a liner forming contact face 6 inwardly inclined.

- 50 In the interior surrounded by the pipe ring 5 is a plate 8 which on its underside carries a periphery pipe ring 9, also of circular cross-section. This plate 8 is secured and held in position by adjustable fixing screws 7. The bottom of the space embraced by this inner pipe ring 9 is closed by a base plate 10 which is tangent to the lowest part of the cross-section of the pipe ring. However, base plate 10 may be slightly set back in the upward direction. The screws 7 permit the levels of the plates 8 and the pipe ring 9 as well as the bottom plate 10 to be adjusted relative to the level of plate 1 of the suction head.

The suction chamber 11 of the suction head is the space that remains between the two pipe rings 5 and 9. As will be understood by reference to Fig. 3 a perforated sheet or wire mesh 12 may be provided inside this suction chamber in order to limit the distance the bag can be drawn into the suction chamber when it is lifted.

In the embodiment illustrated in Figs. 1 and 2 the bottom edge of the outer rim of the suction head as defined by the pipe ring 5 is coplanar with the inner rim defined by the pipe ring 9, the suction opening being the space between the outer and inner rims. According to an alternative form of construction shown in Fig. 4 the base plate 10 may be positioned at a lower level by re-adjusting the inner assembly by re-setting the screws 7.

It will be understood that, if desired, the suction head could be a casting, such as a light metal casting. In such a case it would be preferred to cast the suction head in two parts, one part constituting plate 1, the pipe connection 2, the ring 3 and the outer rounded rim (pipe ring 5), whereas the other part would comprise the plate 8, the inside rounded rim lip (pipe ring 9) and the base plate 10.

WHAT WE CLAIM IS:—

1. A suction head for a vacuum-operated gripper comprising: an annular suction chamber having a suction opening on an underside thereof bounded by rigid inner and outer annular rounded rims for contacting a filled bag, the underside of the inner rim defining a plane substantially at the level of, or proud or recessed with respect to, the outer rim, and the outer rim having an inside wall sloping toward the centre of the suction chamber.
2. A suction head as in Claim 1 wherein a plate is attached to the inner rim.
3. A suction head as in Claim 2 wherein the level of the inner rim and the plate are adjustable relative to the outer rim.
4. A suction head as in any preceding claim wherein the suction chamber has in it a perforated sheet or wire mesh extending between the inner and outer rims to limit the extent to which a bag can be sucked in.
5. A suction head substantially as hereinbefore described with reference to the embodiments of Figures 1 and 2 or 3 or 4 of the accompanying drawings.

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COMPLETE SPECIFICATION

2 SHEETS

This drawing is a reproduction of
the Original on a reduced scale.

SHEET 1

Fig. 1

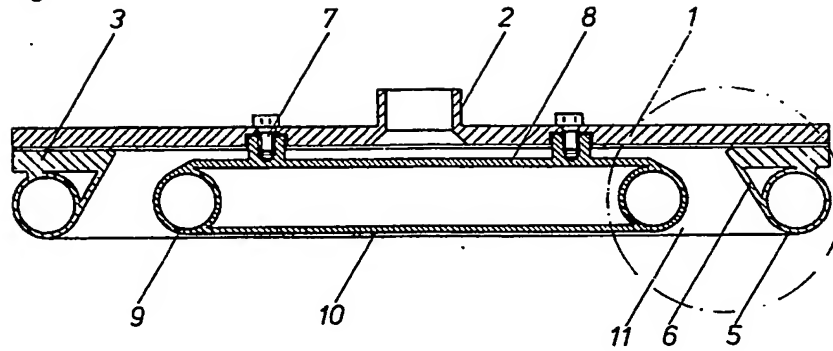


Fig. 2

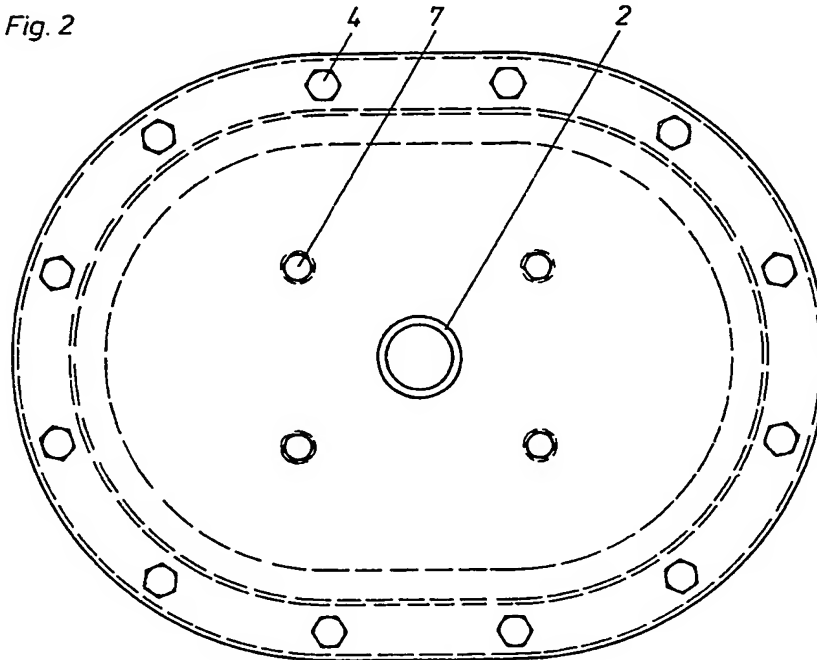


Fig. 3

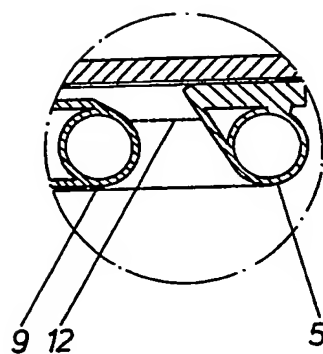


Fig. 4

